EXECUTIVE SUMMARY

High level electromagnetic fields can upset and damage electronics, as well as disrupt or disable computer software. Thus, high power radio frequency (RF) fields pose a threat to electronics and software dependent systems. In particular, critical infrastructures such as telecommunications could be targeted. This report examines the general vulnerability of public and emergency telecommunications networks to high power RF fields. In particular, the following primary questions are addressed.

- Can the loss of a node (e.g., a switching station or a wireless base station), or nodes, cascade through the telecommunications network, causing a large-scale system blackout or crash?

- Can a high power RF device disrupt or disable a node? What vulnerable equipment is located at various nodal types?

The first question addresses network level vulnerability and requires an examination of the system architecture and how redundancy and robustness are used to compensate for nodal loss or overload. The second question addresses nodal level vulnerability and involves estimating the coupling of high level RF fields to sensitive equipment located at a node. In particular, switching stations (the buildings that house switching equipment) and cellular base stations (antenna towers and associated equipment sheds) are considered. Because of the size and complexity of the various telecommunications networks, as well as the multiple providers involved, detailed evaluations of specific systems and nodes are beyond the scope of this examination. Nonetheless, some general conclusions are possible.

- Network level vulnerability is low. The overall public telecommunications network has sufficient redundancy and capacity to withstand the loss of even multiple nodes. A full system collapse is not envisioned as a possible scenario. The loss of certain key system nodes could, however, lead to large local blackouts.

- Nodal level vulnerability is high. Neither public network switching stations nor cellular base stations are intentionally hardened against high level RF fields. Typical steel reinforced concrete walls provide little shielding for frequencies above a few hundred MHz. A switching station could be disrupted (10 to 100 thousand users), although the probability of disruption is difficult to assess due to the variety and complexity of building layouts. Wireless base stations are highly vulnerable to high power devices operating within the base station frequency. The loss of a base station would largely black out the associated cell.